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HOME PROCESSING OF FRUITS AND VEGETABLES

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SUMMERLAND EXPERIMENTAL STATION

EXPERIMENTAL FARMS SERVICE

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HOME PROCESSING OF FRUITS AND VEGETABLES

By

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Introduction

This bulletin has been prepared for the benefit of those who wish to utilize in the home the results of experiments conducted at the Summerland Fruit and Vegetable Products Laboratory. It is supplementary to other Dominion and Provincial Government bulletins which deal with canning, preserving, pickling, etc.

Drying Fruits and Vegetables

The process of preserving food products by drying has numerous advantages under war conditions. Although the process does not preserve as much of the vitamin content as is customarily preserved in canned products, yet with the limitations on the use of cans, sealer tops, and sugar, drying becomes very important. In the drying operation preservation is effected by one of two factors. (1) In the case of fruits, the natural sugars are concentrated until they approximate 66 to 70 per cent of the juice in the dried product. At this concentration the moisture of the product becomes a syrup as thick as that in jam, so that the same principle that preserves jam will preserve dried fruit. In general, fruits are sufficiently dry when a handful firmly pressed together will separate again into individual pieces. (2) In the case of vegetables, the natural sugar content is very low and drying of these products must be continued until they are so dry that growth of micro-organisms is prevented. This will require a moisture content of less than 4 to 5 per cent. When dried to this state leaf vegetables such as spinach will crumble to dust if rubbed between the hands. Potatoes are brittle and break leaving a shiny surface. No evidence of pliability should be present in any vegetable if sufficiently dry. Although a product may be dried to the required moisture content, undesirable changes in flavour, colour, and odour may still take place. These changes are minimized if the instructions given in the sections on "Sulphuring of Fruits" and "Blanching of Vegetables" are conscientiously followed. Sulphuring of some fruits, blanching of vegetables, drying to low moisture content, and as short a drying period as possible are the keynotes to successful operation of this process.

Construction of the Drier

The equipment described herein is a modification of a home evaporator designed and tested some years ago by Dr. W. V. Cruess and Lilian D. Clark of the College of Agriculture, University of California, Berkeley, to whom grateful acknowledgment is made. To adapt the apparatus to British Columbia conditions, it has been slightly enlarged and a chamber heated with a sawdust burner has been used to replace an oil heater. This apparatus is illustrated in Figures 1, 2, and 3. The inside measurements are as follows: height 60″, width 16″, and depth 32″. The cabinet illustrated is made of plaster board with galvanized iron around the heating pipe where it passes into and out of the drier. Because of the possibility of fire, it is important that the drier be constructed of fire-resistant materials and installed on an earth or concrete floor in a small building separate from the dwelling house.

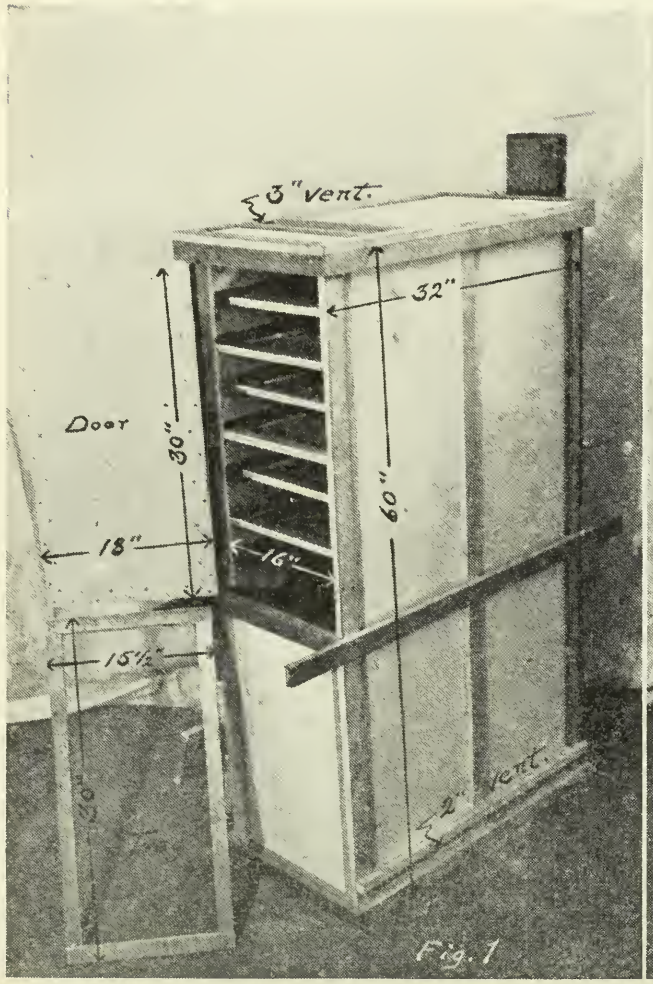

FIG. 1.—View of drier showing 2-inch ventilator in side at bottom, and 3-inch ventilator at top. Note how trays are staggered with 2-inch space at either end. Bottom wire tray removed.

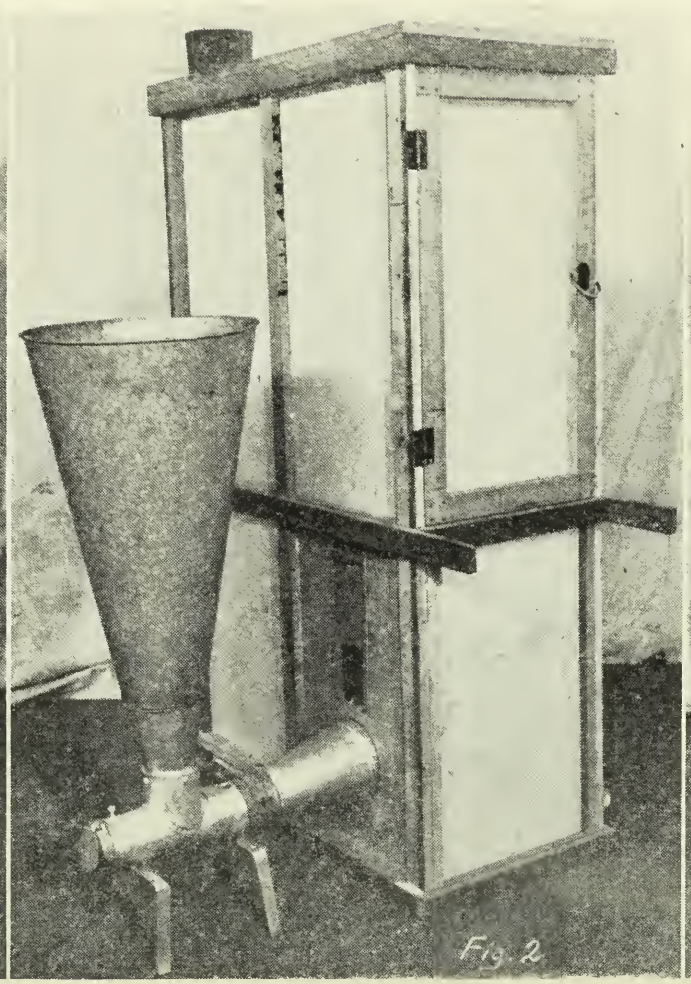

FIG. 2.—View of drier showing postion of sawdust burner and ventilator above heating pipe.

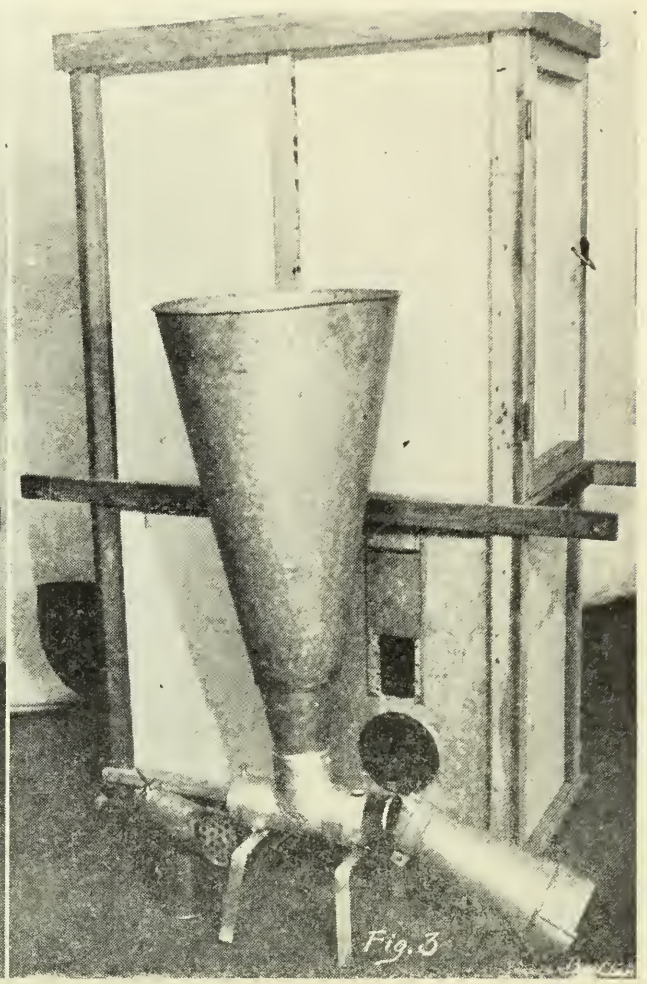

FIG. 3.—View of sawdust burner with parts removed to show detail.

Photographs by J. E. Britton

Trays.—There are seven trays, 15½″ x 30″. If the trays are to be used for vegetables or fruits that are not sulphured, they are made of galvanized window screening and lath ripped to 1″ width. One thickness of lath is placed on each side of the screen with the corner joints overlapping. If the drier is to be used for apples, peaches, pears, and apricots which require sulphuring, the trays should be made of ¼″ x ½″ slats, as illustrated in Figure 4.

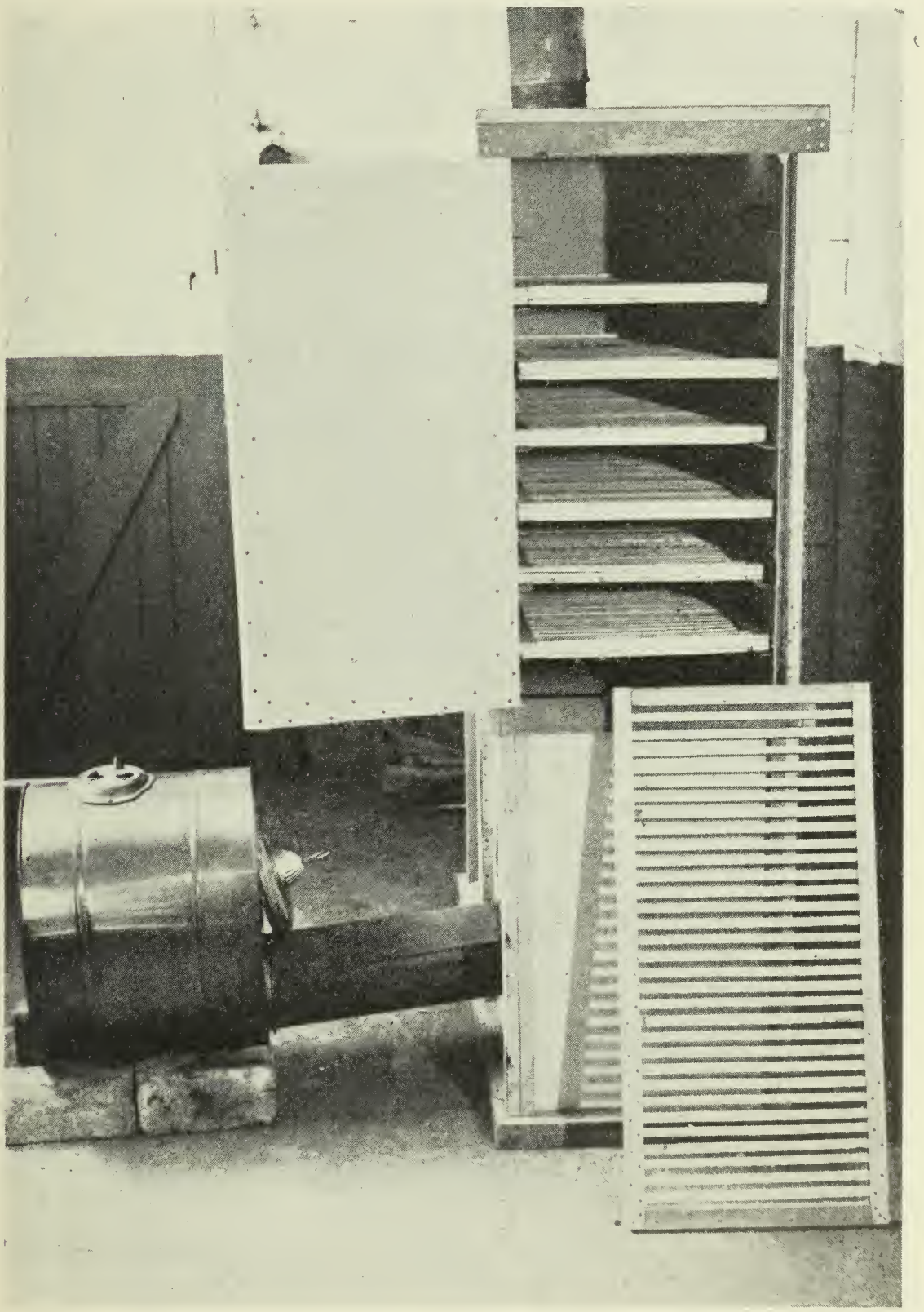

Fig. 4.—View of drier showing position of air-tight heater and illustrating wooden trays.

Cheesecloth.—With wire trays it is necessary to use cheesecloth to prevent the product from sticking or falling through the spaces in the wire netting. Cut pieces of cheesecloth or other thin cloth to fit and place on trays.

Heating Chamber.—The heating chamber is equipped with a 6″ stovepipe ell and approximately 2½′ of pipe. The fire from a 3″ sawdust burner, or coal or wood heater, enters the heating chamber through the 6″ ell and passes out of the heating chamber at the back end. Ten or twelve feet of 6″ pipe is required for stack if a brick chimney is not available.

Sawdust Burner.—Figures 2 and 3 illustrate a small sawdust burner. The body of this burner is a piece of black iron pipe, 3″ inside diameter and 12″ long. Three inches from one end a short 4″ nipple is welded on to the side of the 3″ pipe so as to form a T. This nipple extends about an inch from the side of the pipe. A round hopper is made that fits neatly into this nipple. A piece of 2½″ inside diameter black iron pipe, 8″ long, is cut off on a long angle as illustrated, and a piece of metal cut to fit the sloping surface. This is drilled with numerous $\frac{5}{16}$″ holes and welded on to the 2½″ pipe. A flat piece of metal is hinged from the top on the square end, to act as a damper. This piece of 2½″ pipe becomes the grate and is inserted in the 3″ pipe as illustrated. In the top of the 3″ pipe ahead of the hopper an opening 1″ x 2″ is cut. This also has a hinged damper on it.

In operating this burner, a piece of paper is put down the hopper on to the grate and about half covered with dry sawdust. The paper is ignited and as the sawdust commences to burn, more sawdust is gradually added until the throat of the hopper is closed . The damper in front of the hopper is adjusted so that the smoke coming from the chimney is absolutely clear while the grate can be moved forward or backward to accommodate the flow of sawdust desired. The damper on the grate is used to check the fire.

The efficiency of the burner depends a great deal on the height of the chimney to which it is attached. Increased draft obtained by using a higher chimney aids in the regulation of the burner.

Coal or Wood Heater.—If sawdust is not a local fuel, a small coal or wood heater can be substituted for the sawdust burner. Figure 4 shows an evaporator equipped with an 18″ "air tight" wood heater. It is placed on its end to avoid the use of elbows in the pipe and to shorten the connection. The heater may be insulated with asbestos to save fuel. Nine 100-watt electric light bulbs have also been used successfully as a source of heat.

Heat Spreader.—A sheet of light metal, 12″ x 20″, is suspended horizontally 3″ below the lowest tray, with wires to the corners.

Operation of the Drier

Position of Trays.—Place the trays of prepared fruits and vegetables in the drier with the topmost tray touching the door, the second tray touching the rear wall, the third touching the door, and so on, the remaining trays alternating in a similar fashion until the lowermost tray rests against the door. This forms the air channel which forces the air to flow evenly over all trays. An even flow of air is of great importance, as it carries to the products the heat which causes the drying and carries away the moisture liberated by the heat.

It is not necessary that the evaporator be completely filled with loaded trays. It may be used with any number of trays from one to seven. It is not necessary that the drier be operated continuously. Several different varieties of fruits and vegetables may be dried at the same time.

Temperature.—Place a thermometer having a range up to 212° F. on the centre of the lowermost tray. At the commencement, heat the lowermost tray to not above 150° F. and maintain a temperature range as near as possible to this until the product is half dried. When this point is reached, reduce the temperature to approximately 140° F. The evaporator should be opened at intervals of one-half hour, more or less, and the fruit or vegetables on the trays examined and trays changed in position to cause uniform drying. When fresh fruits and vegetables are first placed in the evaporator, there is little danger of scorching, but when they become about half dried they scorch very easily and a slight scorching destroys the flavour. Therefore, during the later stages of drying, use less heat and regulate carefully. The amount of heat developed by the sawdust burner can be regulated by sliding the grate and opening or closing the draft.

Drying of Fruits

Sulphuring.—Fruits such as apricots, peaches, pears, and prepared apple slices are subjected to the fumes of burning sulphur. These fumes, largely sulphur dioxide, dissolve in the liquid of the fruit and prevent the tissue from darkening. The sulphuring treatment also makes possible more rapid drying and prevents the development of undesirable flavours. Fruits to be sulphured are placed on wooden drying trays and these in turn are placed in the evaporator or in a separate sulphuring chamber. The sulphur may be burned on a flat piece of metal about the size of a pie dish. A half cup of sulphur is sufficient for a chamber the size of the evaporator described in this bulletin. The sulphur is ignited by lighting a small piece of excelsior and laying this on the sulphur. The pan and burning sulphur are placed in the bottom of the sulphuring chamber or on top of the 6″ ell in the drier. If in the latter position, the pan may be placed on the elbow from the door, while the sulphur may be placed on the pan from the ventilator immediately above the opening for the 6″ pipe in the side of the drier. Raising the pan above the ground in the sulphuring chamber with three small stones helps to retain heat in the burning sulphur with the result that more satisfactory combustion is secured. When the sulphur commences to burn, the ventilators at the top and bottom are left open until strong fumes are flowing from the top ventilator. At this stage small boards may be used to close all openings.

Apricots.—Select fruit almost ripe enough to drop from the trees. This fruit should be ripened to the point where it can be harvested, cut in half, and placed on wooden trays without mushing. Cut the fruit in half and place on the trays with the cut side up, and sulphur for 3 to 4 hours. At the end of this period the fruit may be evaporated or it may be sun dried depending on the weather and the facilities available. Evaporating has the advantage that the drying period is reduced to a minimum while sun drying gives the fruit a very attractive orange colour. The fruit is dried until it has a leathery texture such that when a handful is pressed together the individual pieces will separate themselves from the mass.

Peaches.—Peaches are harvested at the latest point in their development that will allow them to be prepared for the drying process without becoming badly bruised. They are cut in half, pitted, peeled, and sliced. The slices are trayed, sulphured for one hour, and dried, similarly to apricots. A knife suitable for halving the peaches and a pitting spoon are illustrated in Figure 5.

Pears.—Pears are harvested at the same stage of maturity as for canning and allowed to ripen in the same manner. When they are to be dried they are

peeled, cut in half, stemmed, cored, and sliced. They are trayed, sulphured and dried in the same manner as apricots. A pear peeling knife and a pear loop suitable for removing the stem, core, and blossom end from the halved pears are illustrated in Figure 5.

FIG. 5.—Preparation utensils. (Left to right). Cannery knife, peach pitting spoon, pear coring loop, and pear paring knife.

PRUNES.—Under the growing conditions of the Okanagan Valley, prunes are picked when they commence to wrinkle at the stem end, or are allowed to fall on the ground. If one waits until the latter stage is reached, he is sure that the maximum maturity for the majority of the fruit has been developed. The fruit is gathered and dipped in a boiling lye solution of approximately two tablespoonfuls of lye per gallon of water. This lye concentration may have to be varied a great deal due to difference in prunes. The object is to finely check the skin so that the moisture of the prune may escape. In some localities, boiling water is sufficient whereas in other places a stronger lye solution than that mentioned may be needed. The length of the lye dip is 15 to 20 seconds. Immediately after lye dipping, the prunes are rinsed in fresh cold water, cut in half, the pits removed, and the fruit placed on the trays.

CHERRIES.—Cherries may be satisfactorily dried by pitting, dipping in boiling water 2 minutes, and drying. The same water should be used for several batches.

GRAPES.—The skins of these fruits should be checked by dipping in boiling water or dilute lye solution (as for prunes) before drying. Grapes may be dried without dipping, but a longer drying time will be required.

APPROXIMATE DRYING TIME FOR FRUITS.—Fruits should be dried until leathery but not hard. By removing a piece of the fruit occasionally and allow-

ing it to cool, the proper degree of dryness may be determined. Fruit when hot will always appear softer and less dry than when cool. The time will range from 3 hours to 3 days, depending on the amount of heat applied and the condition of the fruit.

Drying of Vegetables

Blanching.—All vegetables to be dried should be blanched in either steam or boiling water. If the product is in a form that steam can penetrate and there is not a great amount of disagreeable flavour to remove, steam blanching is strongly recommended as the leaching of the soluble solids during this operation is reduced to a minimum. Blanching sets the colour, removes objectionable flavour, hastens drying by relaxing the tissues, checks ripening processes, and prevents undesirable changes in flavour after drying. The importance of blanching cannot be overemphasized since if this step is not included, products that have been handled perfectly in every other respect will deteriorate rapidly in storage.

The steps involved in steam blanching are as follows: *(a)* Prepare the vegetables and place in a wire basket fitted with a bail, or in a colander. *(b)* Place the basket of vegetables on a rack in a kettle or preferably in a wash-boiler containing an inch of water. *Boil briskly.* *(c)* Heat the vegetables in this steam until each piece is relaxed in appearance and texture, and heated completely to the centre. *(d)* Test by removing a piece from the centre of the basket and press between thumb and forefinger, or taste a piece. The product at this stage should appear cooked, although it is not excessively soft. Spread a layer on trays one-half to one inch deep and place immediately in the evaporator.

To blanch with boiling water simply immerse the prepared vegetables in water which is kept always at a gentle boil. Somewhat less time is required by this method.

While nearly all vegetables may be dried satisfactorily, only the following few are given as being the most likely and suitable ones for home drying.

Beans.—Break or cut into inch lengths, or cut lengthwise into strips, in order to present more drying surface. Beans being tubular in form and of firm texture would otherwise dry very slowly. Steam as directed above.

Peas.—Shell and steam as above. Peas to be dried should be young and tender.

Spinach.—Trim, wash, steam one minute or until all pieces are definitely limp.

Sweet Corn.—Use tender sweet corn. Husk. Steam on the cob until the milk is "set." Cut from the cob and spread on trays.

Soup Mixture.—Choose vegetables to suit taste of the family or as available. The mixture makes a most palatable soup or chowder and can also be served as a vegetable or in stews or salads; two or three varieties can be dried at a time, and in the fall the various dried portions can be mixed. Cut these vegetables into thin strips and slices. Avoid cutting in cubes as a longer time is required for steaming, drying, and refreshing.

Vegetable Powders (Leaf Vegetables).—Crush the dried leaves when hot and crisp from the evaporator, and run through a food chopper twice, using for the second grinding the nut butter attachment. Store away from the light. All dried vegetables can be similarly powdered.

Tomatoes.—Slice, spread on wooden trays and dry.

Approximate Drying Time for Vegetables.—The time of drying will vary markedly with the temperature, the kind of material to be dried, the size of the pieces, the thickness and evenness of spreading of the material on the tray. Vegetables must be made "bone dry." Under "optimum" conditions the various products should dry approximately as follows: soup mixture, 3 to 4 hours; beans, 5 to 7; corn, 4 to 5; peas, 4 to 5; leaf vegetables, 3 to 4.

Dried Fresh Beef.—Cut lean beef into very thin strips, about $\frac{1}{4}$ inch thick. Dip in boiling salt solution of 1 pound salt (2 measuring cupfuls) per gallon of water for 2 minutes. Dry in the evaporator at 140° to 150° F. until brittle.

Packing and Storing Dried Products

The dried products come from the evaporator free from insects and insect eggs, but if allowed to stand exposed to the air are very likely to become infested. While the products are cooling they may be protected to prevent insect infestation. Immediately after the material is cool, pack it in insect-proof containers such as friction top cans, or jars, or tight boxes. When boxes are employed, the products must be stored in a dry place. This is absolutely essential for dried vegetables as they absorb moisture readily. Hence it is advisable to pack vegetables in friction-top tins or sealable jars which are both insect and moisture proof. Dried fruits are not so susceptible to spoilage by moisture absorption, but nevertheless if packed in boxes or cartons damp storage must be avoided. If the products are sufficiently dry they will not mould and should keep in perfect condition up to one year. Storing in a cool place is very beneficial. Dried products, however, like other preserved foods, do gradually deteriorate with time. Fruit, bush beans, corn, and green peas retain both flavour and appearance.

Preparation of Dried Products for the Table

Restoration.—The principle of drying is the removal of sufficient moisture to prevent spoilage. This must be done at a temperature that does not injure the texture, colour, and flavour of the vegetable or fruit. The replacement of this moisture is accomplished by soaking the product in cold water for one to three hours, not longer. The amount of water should be sufficient for restoration and cooking.

Cooking.—Place the product on the stove *in the water used for restoration.* Do not discard any water. Simmer—do not boil. As soon as tender, cease cooking, as otherwise the product soon becomes over-cooked and both texture and flavour are destroyed.

Vegetable Powders.—Spinach dried and powdered is in a very concentrated form. To each cup of puree allow $\frac{1}{2}$ teaspoonful of powder. Soak in cold water $\frac{1}{2}$ hour before adding the other ingredients. For other powdered vegetables, use 2 or more level teaspoonfuls to each cup of puree.

Sun Drying Apricots

Apricots for sun drying should be picked when they have reached their maximum flavour but are still sufficiently firm to withstand the pitting operation without mushing.

The fruits are cut in halves, the pits removed, and the halves placed on wooden trays with the pit side up. The trays are left in a sulphuring chamber at least four hours. It is often found convenient to sulphur them overnight.

Sulphur is burned in this chamber at the rate of 1½ pounds per 100 cubic feet of air space contained in the sulphur chamber. Immediately after the sulphur treatment, the trays are placed in the sun. Two to three days' exposure to the bright sun is sufficient. To test the apricots for proper dryness, five or six pieces are pressed together in the hand and if they separate after the pressure is released, they are sufficiently dry to pack away in storage. It is best to store small quantities in containers which keep the fruit free from insects.

Equipment

Any kind of wooden tray with either a slatted or solid bottom is satisfactory. One of convenient size can be made 31 inches by 18 inches by nailing three sides of apple boxes to two 31-inch strips of 1-inch by ¾-inch material.

The sulphuring chamber is merely a box big enough to accommodate the number of trays to be used in drying the fruit. It is built of two layers of shiplap with a layer of building paper between. This paper assists in making the chamber gas tight. It is closed on all sides except one end which has an opening large enough to slide in trays of fruit to be sulphured. This opening is equipped with a tight-fitting door. There is no floor, and a convenient hole can be dug in which to place a pan to hold the sulphur. The trays are supported with slats on the walls which hold the trays an inch and a half apart.

Sulphuring

After the chamber is filled with fruit, the required amount of sulphur can be placed on a small piece of tin and set in a pit below the lowest tray. This tin is supported with small stones so that the heat developed by the burning sulphur will help to carry on combustion. The pit should be deep enough so that the lowest tray will not be set on fire. Sulphur is easily ignited with shavings. As soon as the sulphur maintains a steady flame, the chamber should be tightly closed and left so for the necessary period.

Cherry Raisins

Cherry raisins are prepared from well-ripened sweet cherries. The fresh fruit is stemmed and pitted, and just covered with water. The water and cherries are brought to a boil and boiling is continued until the cherries begin to elongate, but not long enough for cracking and splitting to result. They are then removed from the heat and allowed to stand at least over night and not more than 24 hours.

After this period, the water is drained from the cherries and 1 pound of sugar added to 1 quart of liquid, after which it is poured back over the fruit. The syrup is drained from the fruit and strengthened daily with 1 cup of sugar to every 4 cups of syrup. If excessive shrivelling results, this proportion must be reduced, whereas if the cherries remain firm and round, additional sugar may be added. When the syrup becomes as thick as honey, it will not ferment and the cherry raisins may either be kept in the syrup or the syrup may be drained from the raisins and the raisins stored in tight containers.

Candying Fruit

Peaches, pears, and apricots should be picked as for canning. After a storage of two or three days, peaches should peel easily and be of a golden colour. Pears, after the usual storage period, should be eating ripe. Apricots should be ready to eat when picked but firm rather than mushy.

Peaches and pears may be peeled and halved. If the fruit is large it may be wise to cut the halves into thirds . Halved apricots are satisfactory or the fruit may be pitted from the stem end and candied whole.

Pre-treatment usually consists of boiling the fruit in water until all the whiteness of the cell tissue has disappeared. The time will vary with the different varieties but in any case the fruit should be boiled till it is clear.

A syrup is prepared with the water used in pre-treatment. One cup of sugar is used for each two cups of water. This syrup is brought to a boil and poured over the pre-treated fruit. If only a small quantity of fruit is to be candied, it may be placed on the back of the kitchen stove where it will keep warm but will not boil. The syrup should evaporate until it is as thick as honey in at least a week. If quantities too large for this treatment are being made, earthenware crocks or large cooking pans may be used. The floating fruit is submerged with plates and saucers. Every day the syrup should be drained off and one cup of sugar added for every 6 to 8 cups of syrup. This addition depends on the condition of the fruit. If it is wrinkled it is not wise to proceed too rapidly. As with smaller quantities, the syrup is concentrated until it is as thick as honey. When this stage is reached, the fruit may be left in the thick syrup. If the latter process is followed, corn syrup should be used in about half the strengthenings to avoid crystallization. It is best to pack the fruit in large bottles and cover with a stopper. If the syrup is sufficiently thick there is no need of sterilization. When the fruit is wanted for use, it may be removed from this thick syrup and placed on screens in a warm location. The excess syrup is caught in pans below the screen. When quite dry, the pieces may be rolled in berry sugar if desired.

If one is busy during the summer, it is advisable to can or bottle the fruit, using a heavy syrup of two parts of sugar and one part water. The candying may then be completed during cold weather when there is less danger of fermentation and accordingly the syrups may be strengthened less frequently. This procedure develops high quality.

Maraschino Cherries

Two main steps are involved in the manufacture of maraschinos, namely, bleaching and candying. Cherries to be bleached are picked in a firm, ripe stage and are placed in a stoneware crock or glass fruit jars and are covered with the bleaching solution. This solution is made as follows:—

1 gal. water.
3 oz. (about 6 level tablespoonfuls) sodium thiosulphate or 2½ oz. sodium bisulphite. These may be procured from drug stores.
1½ oz. (3 level tablespoonfuls) citric acid.
1 oz. finely powdered whiting, or ⅘ oz. hydrated lime.

Enough liquid should be used to cover the fruit. The container should be tightly covered to prevent escape of gas. This may be effected with two layers of heavy brown paper tied with a heavy string. The cherries when packed in this solution are in a storage form and can be held until the winter or a slack season. If more are packed than are needed, the surplus can be held till the following winter. If one wishes to finish the cherries as soon as possible they may be removed from the solution after two weeks and left in fresh water for a couple of days. They are then stemmed and pitted, and boiled for three 10-minute periods, discarding the water after each boil.

After the cherries are stemmed, pitted, and boiled free of the bleaching solution, they are ready to be dyed. It is best to add the colouring to the candying syrup. This syrup is made of a cup of sugar to two cups of water and enough red food colouring is added to make the syrup quite red. Cochineal is satisfactory, although Ponceau 3 R 56 or Erythrosine are used commercially. To each gallon of syrup, one level teaspoonful of citric or tartaric acid is added. The syrup is boiled 3 minutes and is then poured over the fruit. Sufficient syrup is prepared to cover the fruit, and if there is a tendency for the fruit to

float, a saucer or plate may be used to keep it submerged. After 24 hours this syrup is drained from the fruit and to each 6 cups of syrup, 1 cup of sugar is added. If the dye is becoming weak, add more to the syrup. Continue this process every other day until the syrup is as thick as honey. After five additions to the syrup, add one tablespoonful of corn syrup at each strengthening. This will prevent the crystallizing of the cane sugar. After the syrup has reached a honey-like consistency, the cherries may be packed in bottles in the same syrup and about $\frac{1}{4}$ teaspoonful of oil of bitter almond added to each quart jar. They are then tightly capped and no sterilization is needed. If, instead of storing the cherries in this manner, it is desired to dry them for use in cooking, this may be done by heating the syrup and fruit and then separating the fruit from the syrup on a wire screen tray. If only a small quantity of fruit is being treated, the fruit and syrup may be kept warm on the back of the kitchen stove. In this case the heat concentrates the syrup and reduces the labour concerned with the product.

Apple Juice

The juice is obtained from apples by milling and pressing the fruit. A description of a suitable small juice press and method of operating will be found on page 20 of this bulletin.

Although there are several methods of preparing sterile sweet apple juice, most of these are too cumbersome or too expensive for use in the home. The following simple method is suggested for home use where only a few dozen bottles may be desired and no special equipment is available. This method does not give extreme clarity but it does retain the pleasing flavour and health-giving properties of the fresh juice.

1. Strain the sweet juice. Fill clean beer bottles with juice until they are brimming full.

2. Place a wash-boiler containing $3\frac{1}{2}$ to 4 inches of warm water and a slatted wooden false bottom on the stove. Fill the boiler with the full beer bottles. A full bottle in this case has juice within $\frac{1}{2}$ inch of the top of the neck. As the juice expands, the bottle should overflow. If the bottles are stood close together the boiler should hold 29 to 30 bottles. If the proper amount of water has been used it should reach half way up the necks of the bottles.

3. Allow the water in the boiler to heat until it just starts to boil. This is evidenced by the upward movement of the water and the bubbles of steam that reach the surface and burst. Be sure this stage is reached, then move the boiler back to the cooler part of the stove and commence capping the bottles. There should be no air in the bottles when they are capped. If a thermometer is available, a test at the centre of a bottle should show a temperature of 180° F. It is wise to use an aluminum or parchment spotted cap. These caps are the ordinary crown cap with a circular disc of aluminum or parchment on the cork. The aluminum or parchment is much easier to sterilize than plain cork.

In the process of capping, it is wise to lay a few layers of newspapers on the base of the capper to avoid cracking the hot bottles on the cold metal. It is also a good plan to lay newspapers on the table where the hot bottles are to be laid. Lay all bottles on their sides after capping to sterilize the neck of the bottle and the cap.

Another simple method of preserving apple juice, particularly if a thermometer is available, is to heat the juice to 165 to 170° F., fill into hot beer bottles leaving $\frac{1}{2}$ inch head space. Seal immediately. Lay bottles on their sides on a rack in a kettle of boiling water. Cook in boiling water 5 minutes, count-

ing the time from when the water starts to boil strongly. Following sterilization bottles are placed on a table covered with paper or a blanket and allowed to air cool.

A handy "gadget" for removing the hot beer bottle from the boiler, and one which can be made from $\frac{1}{8}$-inch steel wire, is illustrated in Figure 6. In making this holder, two pieces of wire 32 inches long are bent as illustrated in A and B. B is placed beside A and the wires pressed into the open round bends at C. Then the wires E and F are bent at right angles as illustrated in G. The open joint at C is next pressed closed with a pair of pliers. Both sets of wires are then bent to form the handles.

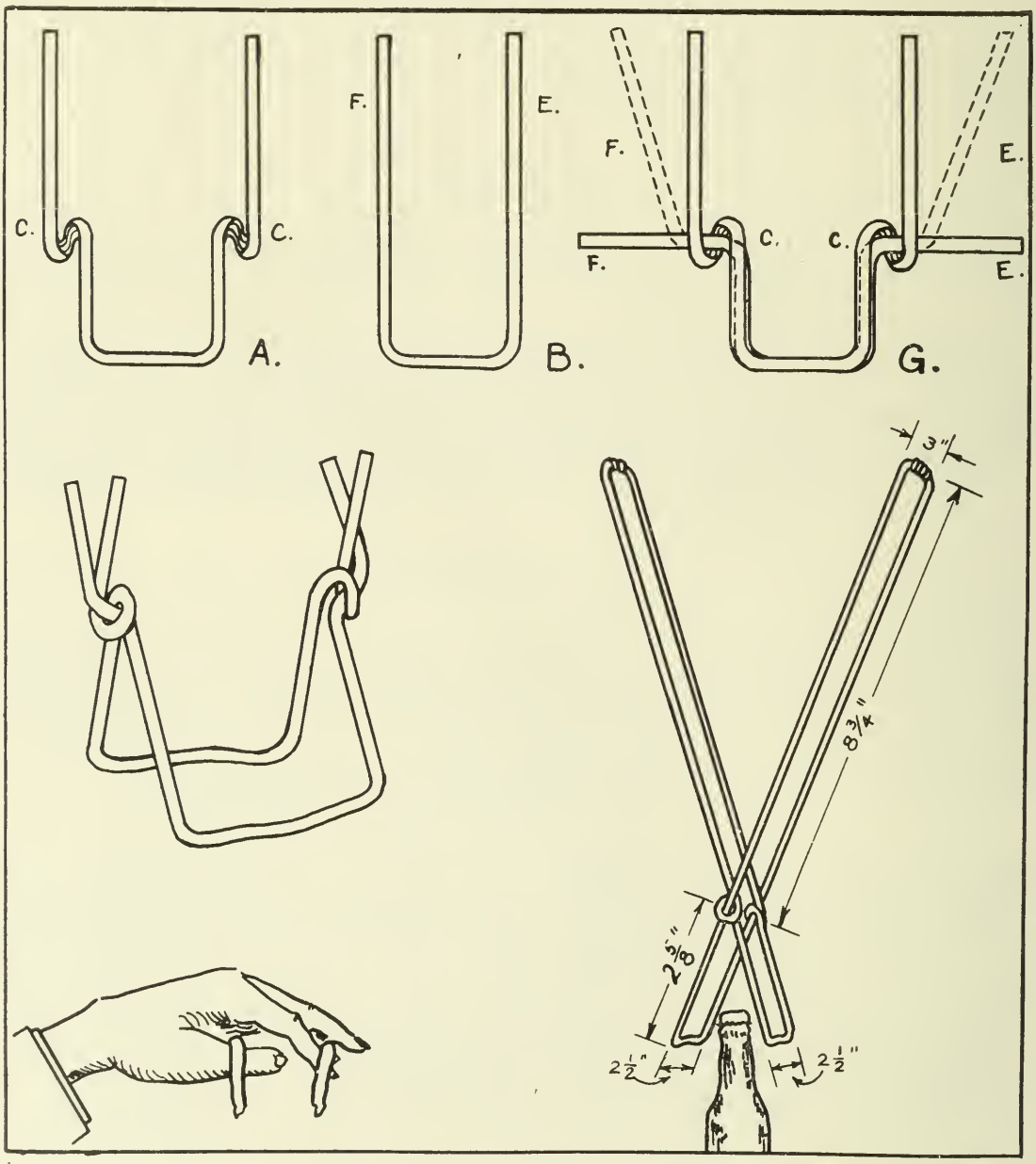

Fig. 6.—Holder for beer bottles.

Jars used in canning may also be employed satisfactorily for preserving juice if beverage type bottles are unavailable. In the first method described, jars are treated in exactly the same manner as bottles. In the second method, juice heated to 165 to 170° F. is filled into hot jars to within $\frac{1}{8}$ inch of the top. Jars are then sealed in the manner required for their particular kind of cap. The lids should preferably be dipped in boiling water before applying to jars.

The jars are then placed in hot water to cover as in canning and cooked 5 minutes in briskly boiling water. Following sterilization, jars are air cooled as quickly as possible.

In the preparation of fruit juices a thermometer is very helpful in heating fruit and juice to the proper temperature.

Grape Juice

A very pleasant grape juice may be prepared in the home from any of the American varieties such as Concord. The grapes are removed from the stems and placed in an enamel or aluminum utensil. They are then thoroughly broken

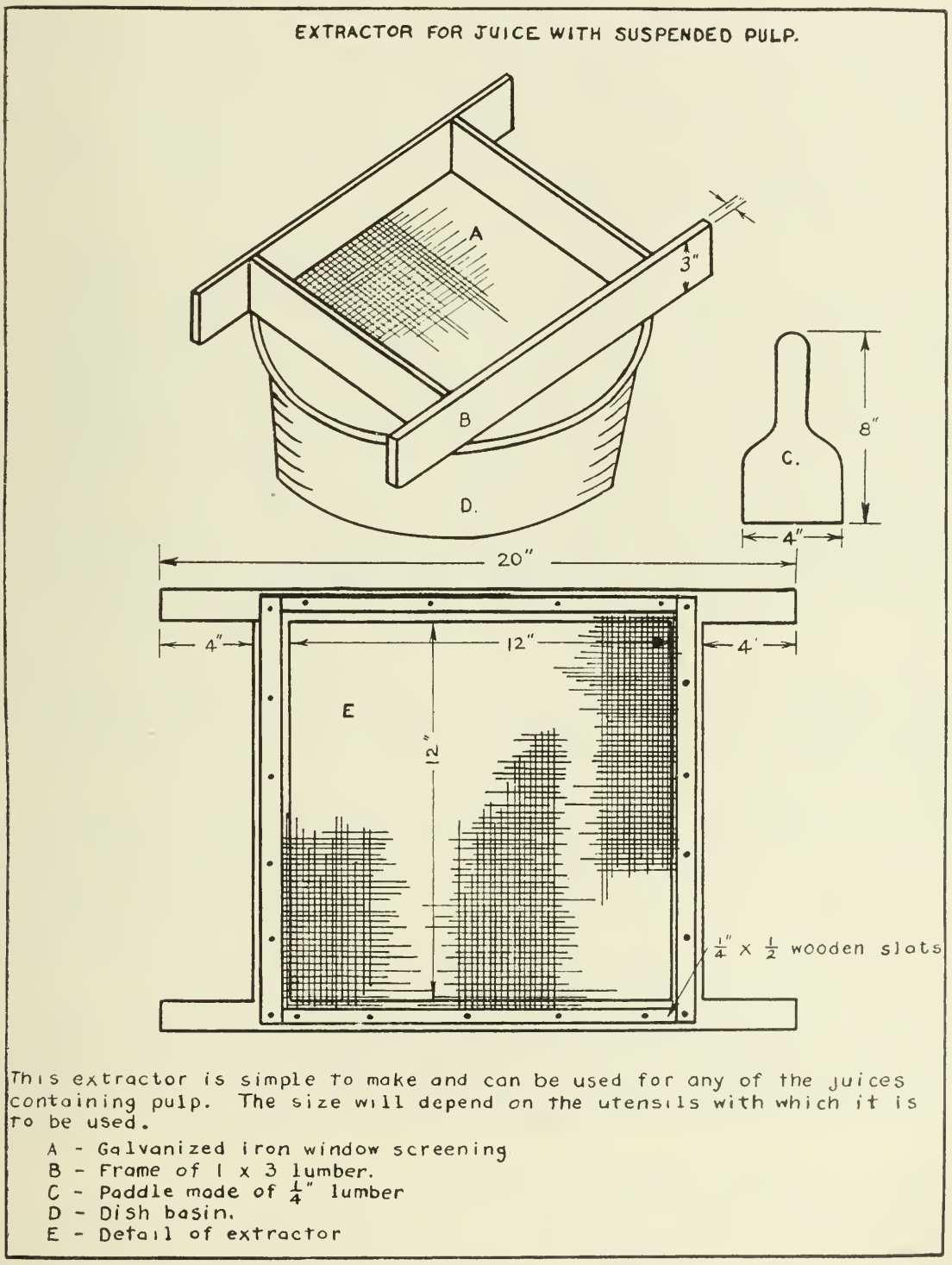

FIG. 7.—Extractor for juices with suspended pulp.

to release the juice, and heated to 160° F., a very light simmer, for 10 minutes. This step serves to release the colour from the skin and other soluble solids from the pulp. The resulting juice, pulp, and skins are then passed through a cheesecloth sack. A small sample of the juice should be cooled and tasted for sweetness. Sometimes as much as one pound of sugar may be needed for every gallon of juice. The sugar is thoroughly dissolved by stirring. The sweetened juice may then be sterilized in the same manner as described for sweet apple juice. Cream of tartar crystals usually settle on the bottom of the container during storage. These crystals are not harmful.

Juices with Suspended Pulp (Tomato, Apricot, and Prune)

Thoroughly vine-ripened tomatoes are stemmed and cored. The fruit is slightly pulped and placed on the stove in a covered kettle. It is heated to boiling. As much fruit is placed in the kettle at the commencement of this step as possible in order to exclude the air and prevent destruction of vitamin C. After the pulp has boiled 4 to 5 minutes, it is ready to be passed through a sieve to remove the skin and seeds. At this point, the necessity of haste cannot be over-emphasized as the juice will lose much of its vitamin value if exposed to the air. If the juice is kept near the boiling point the vapour given off during the extracting will keep the air away from the product.

Return the extracted juice to the kettle and bring just to boiling. At the same time have enough sealers or beverage bottles being kept hot in boiling water. Fill these quickly with juice, seal and place on a rack in a wash boiler or kettle of boiling water deep enough to bring the water 1 to 2 inches over the tops of the jars or bottles. Bottles are placed on their sides. Leave space between jars. If the juice is kept hot beverage bottles may be filled to within ¼ inch of the top. Seal jars according to the kind of cap in the same manner as would be employed in regular canning. If beverage bottles are used, sterilize ordinary caps in boiling water for 5 minutes before use. Aluminum or parchment spotted caps do not require this treatment. Cook beverage bottles on their sides for 10 minutes in boiling water, counting the time from when the water boils briskly. Quart sealers should receive 15 minutes cooking in boiling water.

The juice considered to this point is pure tomato suitable for feeding to babies instead of orange juice. If it is to be used by adults as a before-breakfast drink, it is improved by the addition of salt at the rate of a level tablespoonful to each gallon of juice.

Apricot juice and prune juice can be made similarly to tomato. The addition of a little water to the pulped apricot or prunes just prior to heating will reduce any tendency to scorching. About 2 to 3 cups of water to each 10 pounds of fruit is normally sufficient. Apricot is best if sweetened about 1½ to 2 pounds of sugar to each 10 pounds or gallon of cooked pulp and diluted one to one with water before use. Prune juice, if made from thoroughly ripened fruit, does not require additional sugar.

It is preferable in preparing fruit juice of any kind to employ small batches so one can work quickly and complete the process in a short time. This helps retain the natural flavour and nutritive value of the juice. Sugar is not essential but it helps to keep the colour and flavour of the product.

Extractor for Juice with Suspended Pulp

This extractor (Fig. 7) is simple to make and can be used for any of the juices containing pulp. The size will depend on the utensils with which it is to be used.

Apple Syrup

An attractive syrup suitable for culinary use can be prepared from apples. It may also be used for canning but its amber colour will darken light fruits.

Measuring of Preserving Kettle

Measure 1½-quart sealers (level full) of water into the preserving kettle and mark on a mixing spoon or sliver of wood the depth of the liquid. Add 6½ more quarts of water to the kettle and again mark the depth on the spoon or measuring stick. These marks are thus for 1½ quarts and 8 quarts respectively. Keep these two measurements and discard the water.

Controlling Acidity

Eight quarts of juice, as it comes from the cider press, are placed in the preserving kettle. To every 8 quarts of juice, level dessert spoonfuls of bicarbonate of soda (baking soda) are added to neutralize the acid, according to the following table of varieties:

Variety	Level dessert spoonfuls of baking soda per 8 quarts
Delicious	2½
McIntosh	2¾
Jonathan	6
Grimes Golden	2½
Newtown	4¾
Rome Beauty	4
Stayman	4½
Wagener	3½
Winesap	5¼
Ontario	6½
Spy	4½

These amounts of soda are calculated for the amount of acid present when apples are eating ripe. If the fruit is green, larger amounts of soda are needed. If the fruit is too ripe the foregoing amounts of soda may turn the juice black and consequently should be reduced. The black colour can be overcome by adding additional fresh juice. The juice must be kept slightly acid.

It should be noted that the amount of bicarbonate of soda necessary for each variety as given in the table is based on the normal acidity of British Columbia apples. Apples grown in Ontario, Quebec and the Maritimes are more acid. Therefore, juice from Ontario fruit would require bicarbonate of soda at about the rate given in the table for Jonathan and Ontario varieties. Maritime apple juice would likely need still a little more bicarbonate of soda to neutralize the acid.

Concentrating

The juice is now vigorously boiled until its volume is reduced to the 1½-quart mark as previously determined. Care must be exercised at the end of the boil, as over-concentration results in burning. If burning takes places, the juice becomes very dark and has a bitter taste. The syrup so developed is approximately 60 per cent sugar. This is not enough sugar to prevent spoilage but if the syrup is placed in previously warmed sealers, immediately sealed and inverted, it will keep well.

This syrup can be used for home canning of fruits by diluting it with water when needed. One quart of water with two of syrup is a satisfactory dilution. It is also attractive in candy where it replaces corn syrup. When it is used in candy the water in the formula can usually be omitted.

Pectin from Apples

Many fruits are low in pectin, and consequently if a jam or jelly is to be made from them, pectin in some form must be added. For use in the home, where a trace of apple flavour would not be a disadvantage, a pectinous solution can be made from apples.

Any sound apples slightly immature may be used. The fruit is washed and cut into pieces not more than half an inch thick. These are placed in a jam kettle and sufficient water added to make up half the volume of apples. The kettle is covered and placed on the stove where it may come slowly to a boil. Boiling continues for up to 30 minutes. One should be careful in boiling the apples to avoid letting them break down to a mushy consistency. If this takes place the resulting product will resemble apple sauce, whereas the liquid should not contain any fruit pulp and should be a thick solution with a slightly opalescent colour. When boiling is complete, the liquid is drained from the apple, placed in another pan and boiled to one-quarter of its original volume. It is then bottled in quart sealers and boiled 20 minutes. If 2-quart sealers are used, the time should be increased to 30 minutes.

This product will keep well and may be used in making jellies and jams. One will learn by experience the amounts to use in various products, but in general it will be weaker than the commercial product.

Vinegar

The process of making vinegar consists of two distinct steps, namely, the fermentation of the fresh juice and the acetification of the fermented juice. These may be outlined as follows.

Fermentation

1. Use a clean sound barrel, cask, or crock. Scrub with scalding water and weak lye if the container is not new.

2. Fill with fresh juice and add one yeast cake to every 5 gallons.

3. Fermentation will be complete when the small bubbles stop rising to the surface.

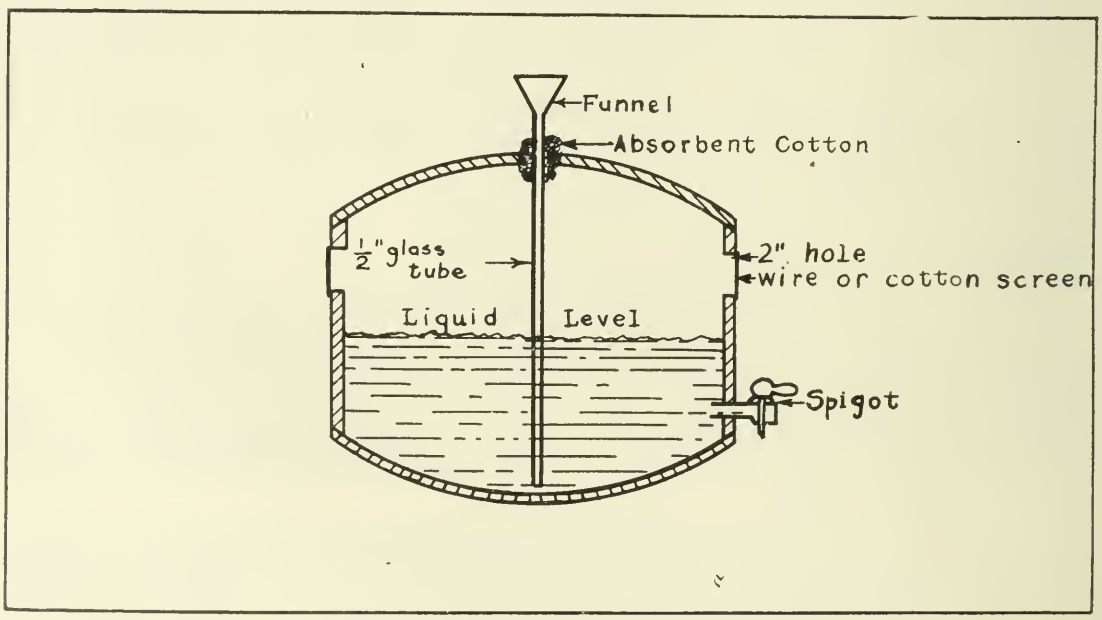

Fig. 8.—Keg for making vinegar.

Acetification

A 10-gallon keg is a suitable container in which to conduct the process of acetification. Place the keg on its side and bore a 2″ hole near the top of each end. Screen these openings with wire to prevent entrance of insects while permitting passage of air. A spigot should be placed in one end of the keg near the bottom. The fermented juice to which some old vinegar or "mother" has been added is then poured in through a funnel as shown in Figure 8 until the keg is half full. This apparatus works best when placed in a location where a temperature of at least 70° F. is maintained. If trouble is encountered from the staves on the top side of the keg "drying out," the apparatus can be arranged so that the same system is used but the keg is kept in an upright position and filled only half full.

Finished vinegar should be ready in six weeks. As it is drawn off, more of the fermented juice may be added. Small batches may be finished in crocks or open casks.

Juice Press

The juice press described here has been constructed with the object of providing a practical construction plan for those individuals who wish to make juice for home use but who do not enjoy the opportunity of having juice pressed at a commercial plant. The press has been designed primarily for apples but it can be used for pressing any pulped fruit. The grater can be used for any fruits free of large stones. With apples it will handle from one to five boxes yielding 2 to 10 gallons at one pressing.

The essential parts consist of the frame, drainboard, rack, trays, platform, grater, and hopper. It has been found advisable to construct the parts of the press in order in which they are listed in the following paragraphs.

Frame, Parts I, T, L, and C (Illustrated in Figure 9)

The four corner posts (I) are made of dressed 4″ x 4″, 47″ long. The dressed size will vary from $3\frac{1}{2}$″ to $3\frac{3}{4}$″. These posts are joined together with 2″ x 4″ braces (T), 12″ from the bottom, and at the top. These are set into the corner posts sufficiently so that their outer surface will be flush with the piece of $\frac{3}{4}$″ x $2\frac{1}{2}$″ nailed on to the posts immediately above the lower braces. The 2″ x 4″ braces and the $\frac{3}{4}$″ x $2\frac{1}{2}$″ are cut at a 45° angle at the corners. The length of these pieces is 28″.

The top 2″ x 4″ braces (T) on both sides of the press are strengthened by $1\frac{1}{2}$″ angle iron (C) 28″ long. Holes large enough for $\frac{1}{2}$″ rods are drilled $9\frac{3}{8}$″ (measured to the centre of the hole) from each end. Two pieces of $1\frac{1}{2}$″ angle iron $19\frac{3}{4}$″ long, with similar holes $5\frac{3}{8}$″ from each end, reinforce the lower side braces (T). Holes are bored in the 2″ x 4″ braces to correspond with the holes in the angle iron. The $\frac{1}{2}$″ x 37″ rods (L) are put in place and the nuts tightened until the rods are firm.

The same 2″ x 4″'s in the lower group that are drilled to accommodate the $\frac{1}{2}$″ rods are also notched in four places to take care of the reinforcements on the rack (P). These are illustrated in Figure 10. These notches are $1\frac{1}{2}$″

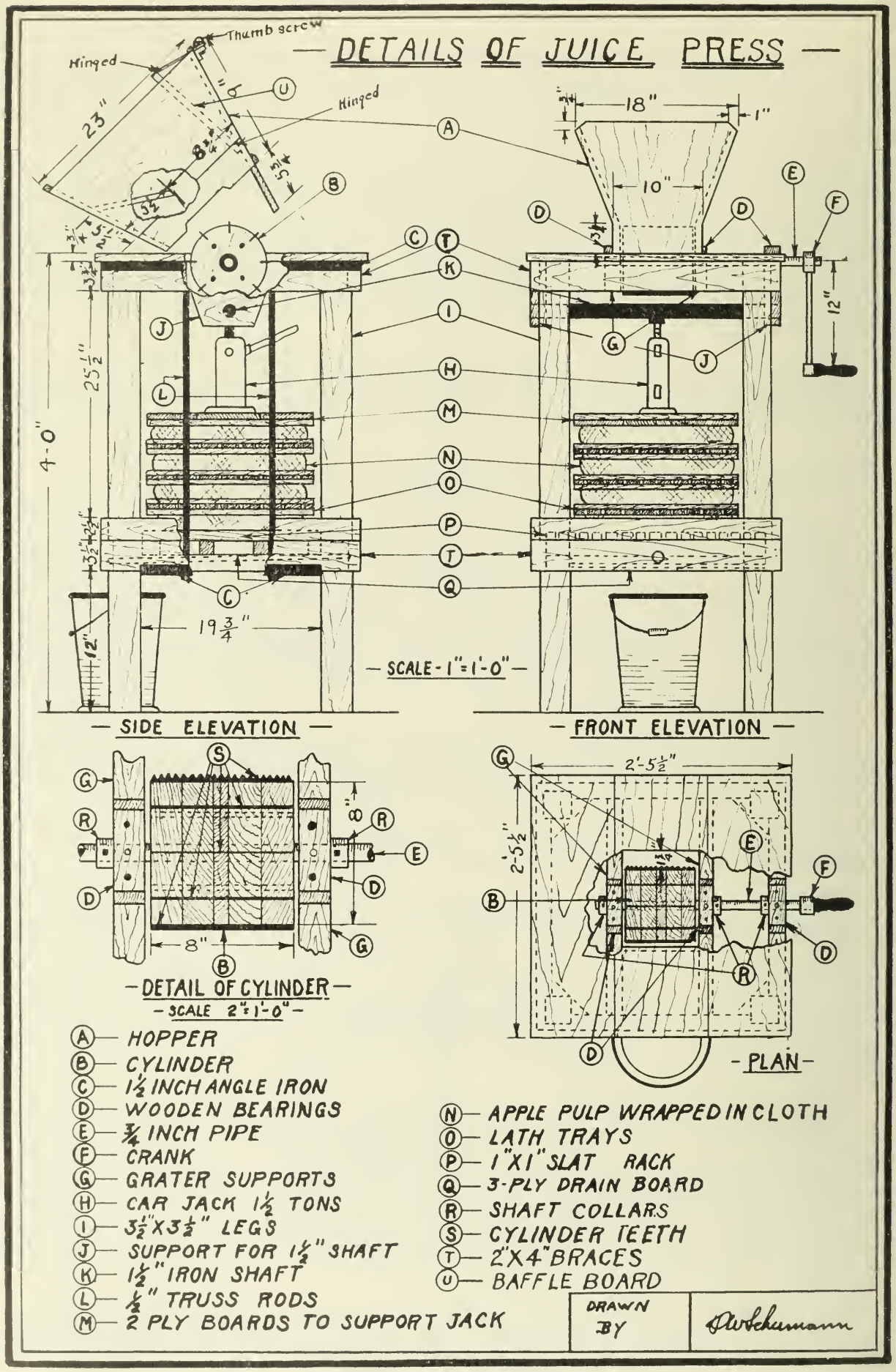

FIG. 9.—Juice press.

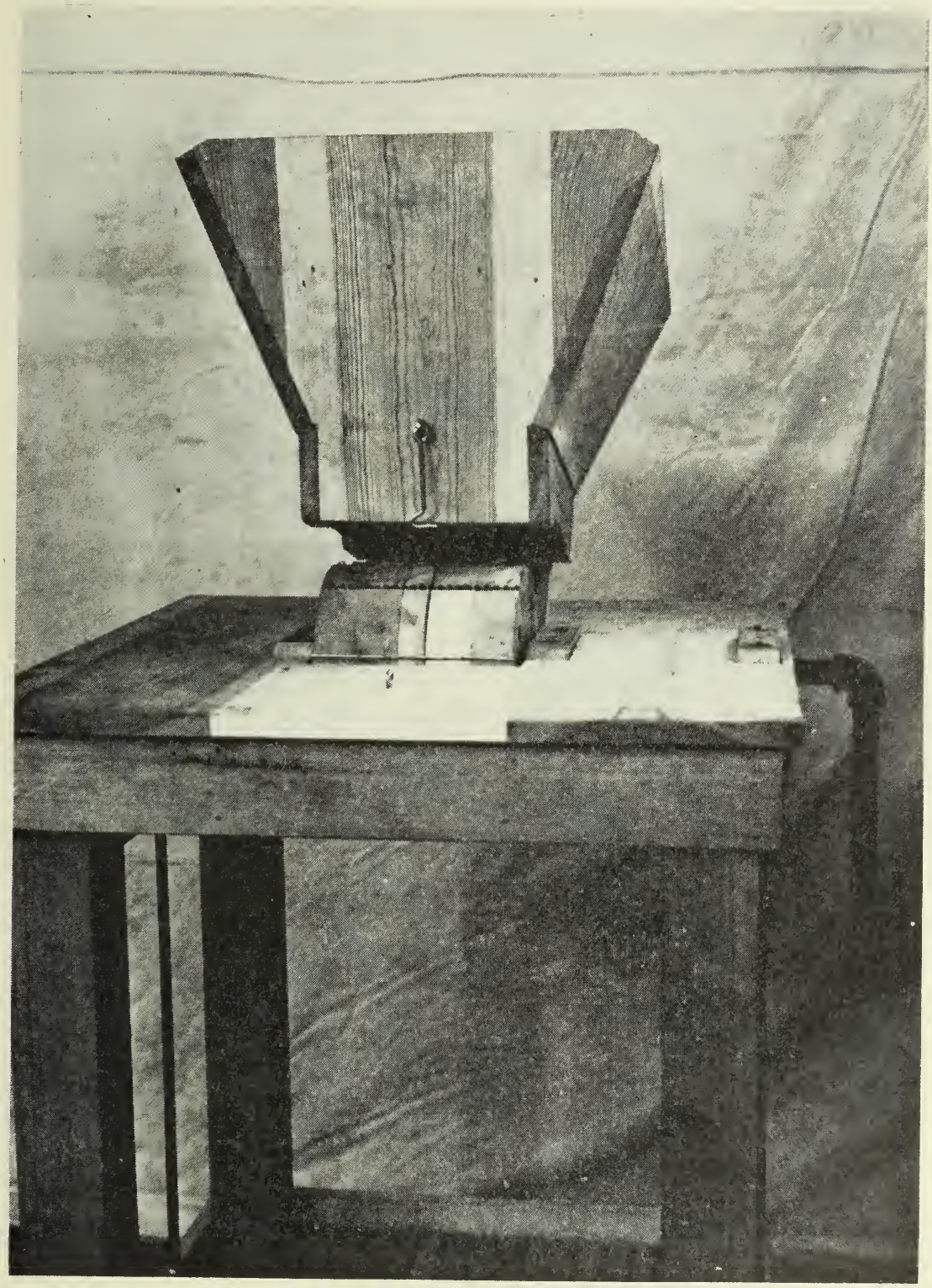

FIG. 10.—Fruit press hopper and grater.

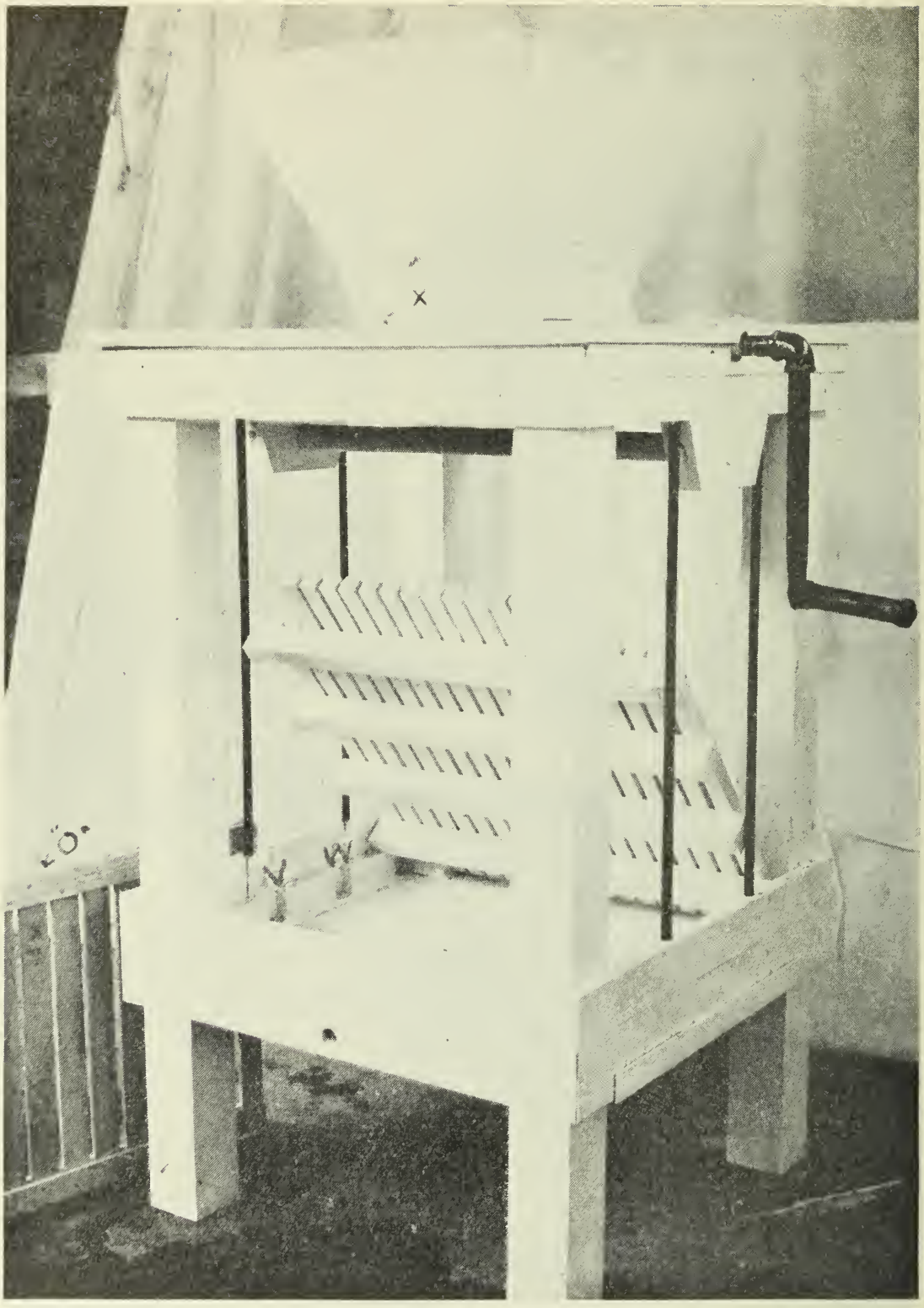

FIG. 11.—Juice press.

V and W illustrate notches in braces (A) to accommodate rack (P).
O—Lath tray.
X—4-inch hook and eye.

wide, $1\frac{3}{4}$" deep, and $\frac{3}{4}$" into the 2" x 4". Two of these notches are situated $\frac{1}{8}$" from the corner post while the near side of the other two is 6" from the corner post.

3-Ply Drainboard, Part Q

A piece of 3-ply is tightly fitted into the square space developed by the lower 2" x 4"'s (T). This 3-ply is located so that the high side opposite the drain hole is 2" below the top of the 2" x 4" brace, while the side near the outlet hole is $2\frac{1}{2}$" below the top of the 2" x 4" brace. Any rough stripping can be used below the 3-ply to form a ledge while small right-angled triangles of $\frac{3}{4}$" material can be nailed in the corners for reinforcement. The length of the sides of these triangles on each side of the right angle is the distance from the corner formed by the brace and the corner post to the inside corner of the post. This will be in the neighbourhood of $2\frac{1}{2}$". A suitable moulding for the top side to seal the joint between the 3-ply, the braces, and corner posts may be made by planing $\frac{1}{2}$" x $\frac{3}{8}$" strips to almost a triangle in cross section. The 3-ply catches the juice and delivers it to the 1" hole in the 2" x 4" brace in the front of the press.

Any easily worked metal can be used instead of the 3-ply provided it is painted with a good paint and thoroughly dried. Four-hour white enamel is suitable.

Rack, Part P

The rack is made of 19 pieces of 1" x 1" nailed on to four stringers of $1\frac{1}{4}$" x $1\frac{7}{8}$". The stringers are spaced so that they will fit into the notches previously described in the side braces. The stringers and the 1" x 1" pieces should be made of the strongest wood available as the rack has to withstand the full pressure of the jack. The two 1" x 1" pieces on each side of the rack are cut off flush with the first stringer to allow room for the corner posts. The rack is removable so as to facilitate cleaning.

Lath Trays, Part O

Standard laths or wooden strips $\frac{3}{8}$" x $1\frac{1}{2}$" are cut to a length of 19". A tray is 19" square and consists of a single layer of laths placed parallel to one another and the thickness of a lath apart. These laths are crossed at each end (above and below) with laths that hold the rack together. Copper clout nails, one to a lath, are driven in from both sides. Five lath trays can be used at a time. These are illustrated in Figure II, Part "O".

Pressure Platform, Part M

This is made of 3 pieces of 1" x 6" x 19" crossed by 3 other similar pieces. As this platform is subjected to considerable strain it is wise to nail it thoroughly with nails long enough to clinch.

Wooden Bearings, Part D, on Grater Supports, Part G

Take two pieces of 2" x 4" x 25" for grater supports (G) and bore the bearing holes as directed in the following before nailing them in place. Mark the centres of the 2" x 4"'s and attach 2" x 2" x 6" pieces on the 2" edge at the centre using 6" x $\frac{3}{8}$" bolts at each end of the bearing cap. Bore a 1" hole at the centre, half in the cap and half in the 2" x 4" (G). Quarter-inch oil holes can be bored in the top of each cap. These 2 pieces of 2" x 4" are now nailed lengthwise through the frame braces (T) $8\frac{1}{2}$" apart. They are $6\frac{1}{2}$" from the inside of the side 2" x 4"'s.

If the hole for the bolt through the bearing cap on the side of the shaft farthest from the drain hole is $1\frac{1}{2}$" from the centre of the shaft, the end of the bolt may be used to attach the scraper roller later described.

Grater, Part B

There are two ways of making this part. The easier is take a solid piece of wood and turn it down on a lathe or plane it to obtain a cylinder 8″ long and 8″ in diameter. The disadvantage of this method is the possibility of splits developing. The second method is to take sufficient thickness of board to make 8″, to bolt them together with four bolts countersunk at each end, and to turn the boards into a cylinder 8″ x 8″. A 1″ hole is also drilled through the centre.

The circumference of the cylinder is marked into eighths and lines drawn lengthwise on its surface. On each line a sawcut is made in which the blades will be fitted. The depth of these cuts will depend on the size of the blades being used. In seven cuts, pieces of a coarse saw blade (such as a bucksaw or pruning saw) are placed with $\frac{3}{16}$″ of teeth protruding from the cylinder. In the remaining cut, the blade is placed upside down so that a smooth edge protrudes to the same extent as the teeth. An example of the teeth used and also a smooth blade are shown in Figure 10.

Shaft, Part E

A 23″ piece of $\frac{3}{4}$″ pipe is used as a shaft. One-quarter inch holes are drilled at each end of the cylinder so that pins may be inserted to keep the cylinder from turning on the shaft. Collars (R) are also used on the shaft to keep the cylinder properly spaced between the bearings. These collars are $\frac{3}{4}$″ lengths of 1″ pipe with a set screw through one side. The bearing caps (D) should be marked so that they will be replaced in the same position as they were originally made.

Hopper, Part A

A hopper as illustrated can be built to fit over the grater. Notches are cut out of the sides of the bottom to fit over the bearing caps. The hopper may be removed to facilitate cleaning by releasing the 4″ hook and eye at each end (Fig. 11). The baffle board (U) is hinged at the bottom and can be adjusted to different positions by loosening the thumb screw. The lower edge of the baffle board is tapered to a $\frac{1}{4}$″ thickness, this taper extends back $2\frac{3}{4}$″. The taper is on the side of the baffle board facing the grater. The purpose of this board is to force the apples against the grater. The position in which this board works best will be found in actual operation. If it is not possible to obtain an 8″ piece of flat iron slotted except at each end, with which to adjust the baffle board, then holes may be drilled through the side of the hopper to match a hole in the baffle board and pegs or nails used to hold the board in different positions.

Top Covering

The top of the press may be covered with any $\frac{3}{4}$″ material. The boards covering the side through which the shaft passes must be notched on the under side so as to fit properly over this item.

Pressure Bar, Part K

K is a piece of $1\frac{1}{2}$″ shafting and is sufficiently strong to resist most of the pressures used. However, if sufficient pressure is being used to bend the shaft then a piece of 4″ x 4″ can be placed on the under side of the shaft. This 4″ x 4″ can be notched so that it fits over the support for the shaft (J). This notching will prevent the 4″ x 4″ turning on the shaft.

Scraper Roller

When the grater is turned by hand there is not sufficient speed to keep it clean. Consequently grated pulp rides around on the cylinder and eventually clogs the throat where apples are ground. To overcome this a piece of $\frac{1}{2}$″ or $\frac{3}{4}$″ garden hose, 8″ long, can be placed on a piece of $\frac{3}{16}$″ rod or heavy wire, as illustrated in Figure 12. This roller is secured by the nuts of the bearing bolts on the throat side of the grater. The ends of the wire are flattened and slightly bent so as to maintain a small tension against the grater. The hose thus lies lengthwise on the cylinder and scrapes off the pulp. When it is hit by the blades, the hose rolls on the rod. If the grater is driven with an electric motor this roller **must** be removed as the increased speed causes the rubber to be cut by the blades.

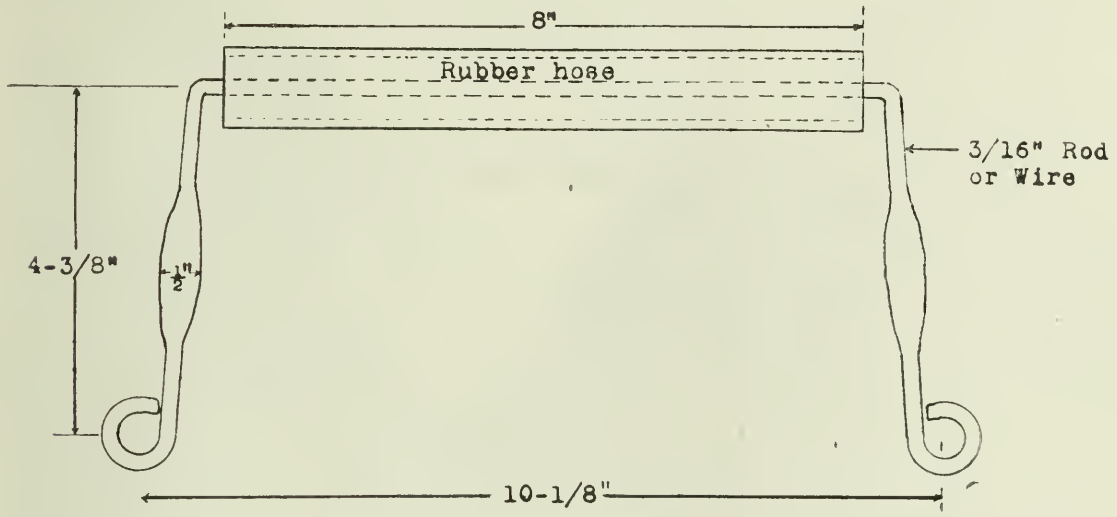

Fig. 12.—Detail of scraper roller.

Painting

It is desirable to paint the press with white paint or 4-hour enamel. This prevents warping and checking of the wood and materially assists in keeping the apparatus clean.

Operation of the Press

Apples are placed in the hopper. A piece of unbleached factory cotton, 36″ x 36″, is placed on the slatted rack (P) with the corners of the cloth in the middle of the sides of the rack. The apples are grated until the resulting pulp will form a layer 2 to 3 inches thick and 18 inches square. The corners of the cloth are then folded over the pulp, completely enclosing the mass. This is commonly called a "cheese." A lath tray (O) is then placed on top of this apple pulp and cloth and the operation is repeated. If a short jack is used, five cheeses can be pressed at one time, yielding approximately 10 gallons of juice. The pressure platform (M) is placed on top of the last cheese. The jack is worked between this and the shaft (K). If this shaft is bent or the jack becomes too short, the piece of 4″ x 4″ previously described can be used. If it is desirable to press only one box of apples, a few pieces of heavy timber can be used on top of the pressure platform to raise the jack up to the shaft.

Where power is available, a $\frac{1}{3}$-horsepower motor, 1,750 r.p.m., can be used to turn the grater. A 3″ sheave for a V-belt is placed on the motor and a 12$\frac{1}{2}$″ sheave on the grater shaft. An automobile V-shaped fan belt makes a suitable drive. This is illustrated in Figure 13. Care should be exercised not to feed the apples too fast and not to feed any apples until the grater has been started.

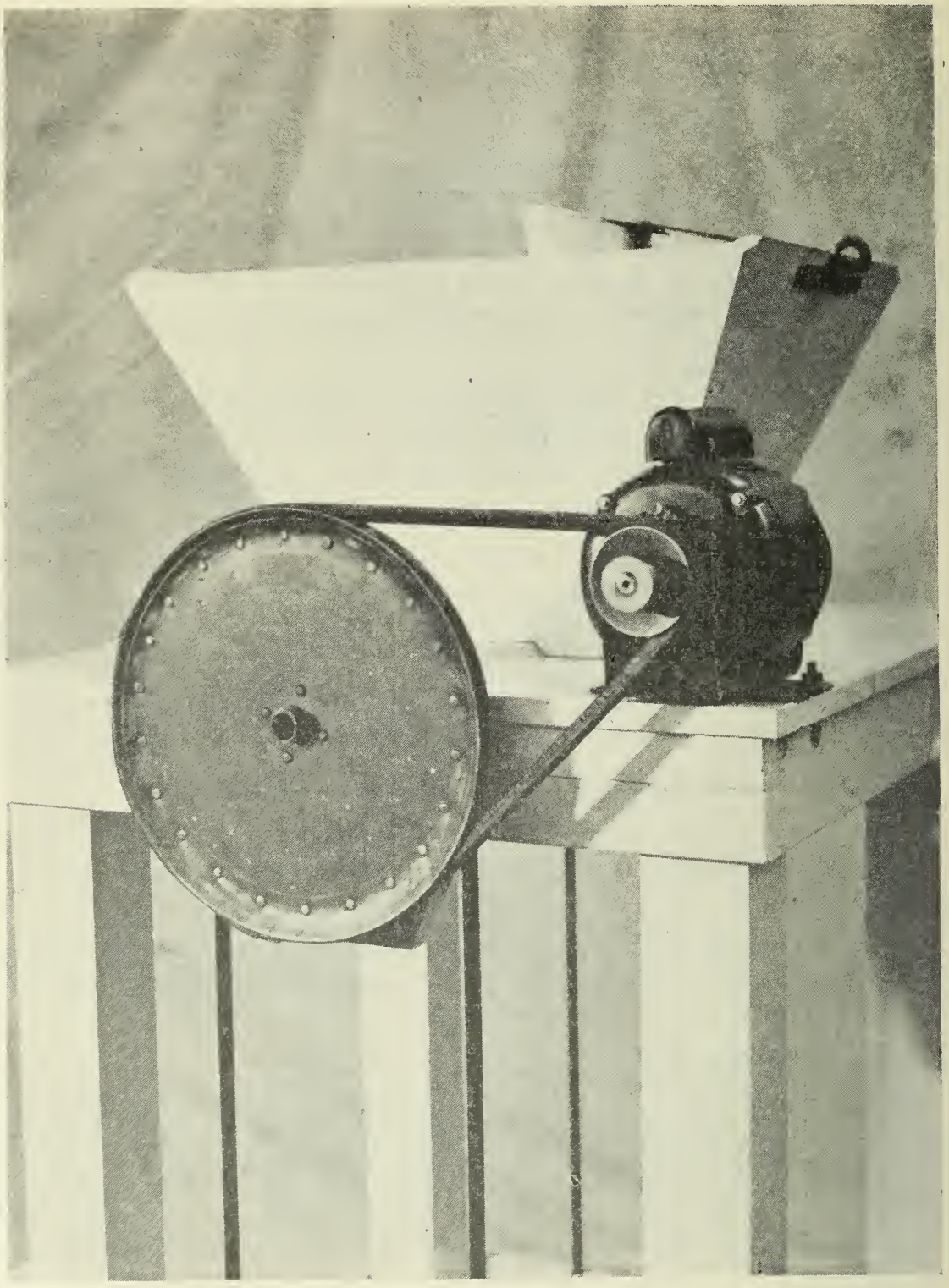

FIG. 13.—One-third horsepower motor arranged to operate grater on the juice press.